ARTICLE VII.

ASTHMATOS CILIARIS.—IS IT A PARASITE, THE CAUSE OF CATARRHAL AFFECTIONS? By JOSEPH LEIDY, M.D., Professor of Anatomy in the University of Pennsylvania.

IN the number of the *Virginia Medical Monthly*, for November, 1878, the leading article is entitled "Rhizopods (Asthmatos ciliaris) a Cause of Disease. By Ephraim Cutter, M.D., Boston." According to this communication there exists a parasitic animal, which is the ordinary cause of influenzas, catarrh, hay fever, and the like affections. The discovery of the parasite and its agency in disease are attributed to Dr. J. H. Salisbury, who published a paper on the subject in Hallier's *Zeitschrift*, Jena, 1873. From the original account it would appear that a peculiar animalcule, the *Asthmatos ciliaris*, is the cause of "infusorial catarrh and asthma." The parasite is stated to assume a great variety of shapes and sizes during the different phases of its existence. Descriptions accompanied with figures are given of many of its varieties of form. Its mode of reproduction is described, and it is asserted that from time to time the *Asthmatos* gives birth to living young.

Afterwards follows a description of the catarrhal affection induced by the parasite. In reference to the season of its invasion, Dr. Salisbury remarks, that "when it occurs during the latter part of the summer and early autumn, it is usually called 'hay fever' or 'hay asthma.'" The author regards the affection as contagious. In speaking of the treatment, he says that "the only remedies that do any good are such as either destroy or retard the growth or reproduction of the parasite."

The observations of Dr. Salisbury are confirmed by those of Dr. Cutter, who gives his experience of cases of the disease, and the results of his examinations of the supposed parasites. In some of his researches he was assisted by Prof. Paulus F. Reinsch, of Erlangen, Germany, an able microscopist, who also made drawings of the *Asthmatos*, which accompany the communication. Dr. Cutter defines the position of the *Asthmatos* in the zoological series, and refers it to the class of Rhizopods with close affinity to the sun animalcules or Actinophryans.

In conclusion Dr. Cutter remarks "that there is a parasitic animal found in the secretions of the respiratory tract of persons suffering from influenza, colds, catarrhs, and asthmas." Dr. Salisbury, the discoverer, has observed over 1000 cases; Mr. Daykin reports a case; Dr. Reinsch, two cases in one individual; and the writer has observed about 100 cases." Dr. Cutter adds that "it is supposed to be the cause of the disease named because it is infectious; parasiticides kill it; with its death comes instant relief to the symptoms of the disease; and when carefully looked for, it is found to exist in this class of cases and not in other catarrhs."

The number of the *Virginia Medical Monthly* containing the communication of which the above is a brief notice, came to me while I was actually affected with a catarrh akin to hay fever, similar attacks of which I have had, sometimes during the autumnal season, for many years. Dr. Cutter appeals to the present writer as to the true position of *Asthmatos ciliaris* in the zoological system. From the descriptions and drawings, its characters would assign it to the class of Infusoria and order Ciliata, rather than to the class of Rhizopoda. If it were a distinct animal, according to the classification of Stein, it would be a peritrichous ciliate infusorian.

Is the object named *Asthmatos ciliaris* really an animal parasite? was the question which occurred to me on reading Dr. Cutter's communication. From a copious expectoration of frothy, glairy mucus I placed a portion beneath the microscope with an objective power of $\frac{1}{10}$ inch. There surely, among a multitude of other cell elements, were many specimens of the *Asthmatos ciliaris*, in lively condition and exhibiting truly "a great variety of shapes and sizes." Some of the specimens were dead, but most of them were in a state of high activity. Though stationary in position, they rocked from side to side, like Chinese idols in motion, while the cilia covering the head waved in a flame-like manner. It was the waving of the cilia which produced the rocking motion of the body.

Many of the *Asthmatos* were round and about the size of the associated mucus corpuscles, with cilia crowning rather less than half their extent, as represented in Figs. 1, 2. Others were reniform, with the cilia springing from the concave side, as seen in Figs. 3, 4. Larger ones were round, oval, or ovate, as seen in Figs. 5, 6, 7; and still larger ones were biscuit-shaped, as in Fig. 8, or gregarina-like, as in Figs. 9, 10. Others presented more or less irregular modifications of the common form of the columnar ciliated cells of the air passages, as seen in Figs. 11–15.

Many of the ciliated bodies appeared without a nucleus; others presented a pale granular globular nucleus, and occasionally one would present two such nuclei; in others the nucleus was larger and oval and provided with a nucleolus. Some of the ciliated bodies contained small pinkish vacuoles, variable in number and quite passive. There were other cells associated with the ciliated ones of the same forms, but without the cilia, as if these had been removed, as seen in Figs. 16, 17.

Though very unlike the normal ciliated epithelial cells of the pulmonary air-passages, and certainly bearing resemblance to some of the peritrichous ciliate infusorians, my interpretation of these bodies has always been that they were incomplete or deformed ciliated epithelial cells. I say has always been, for I have previously and repeatedly observed the same bodies, and it never crossed my mind that they were anything else than ciliated epithelial cells more or less modified by the condition of the catarrhal affection. With the subsidence of the catarrh, the desquamated ciliated epithelial cells diminish in number in the expectorated mucus and finally disappear, as if they had ceased to be thrown off from the mucous membrane.

The expectorated catarrhal mucus ordinarily contains a multitude of cell elements presenting considerable variety of form, all of which I have attributed to the epithelium of the air-passages, more or less modified by the catarrhal affection. The most common constituent consists of the so-called mucus corpuscles, represented in Figs. 18–20, closely resembling colourless-blood corpuscles. These are spheroidal, pale, granular bodies, with no visible nucleus, and measuring from .009 to .012 mm. Usually isolated, they frequently lie in pairs and chains up to half a dozen or more. They often present a roughened aspect due to feeble extensions of the protoplasm as in the amœboid movement of colourless blood-corpuscles. Another element consists of larger spheroidal or ovoidal corpuscles, Figs. 21, 22, composed of granular protoplasm mingled with variable proportions of oil globules, and often appearing to have a central nucleus more or less obscured by the surrounding material. These corpuscles measure from .018 to .024 mm. or more.

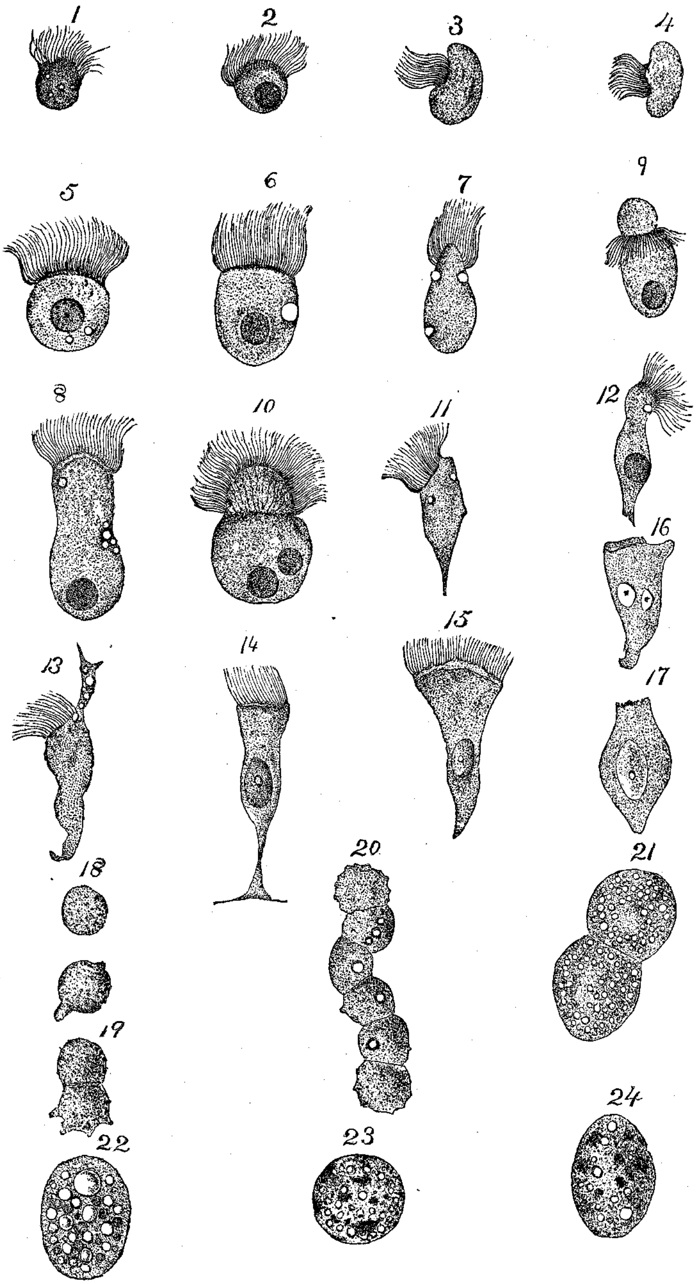
In my own habitual condition of health, for several years, I have been troubled with slight bronchial irritation accompanied with occasional coughing. The expectoration in small quantity consists of clear glairy mucus with little patches of dirty-yellow muco-purulent matter. I at first attributed the dirty hue to inhaled dust, but microscopic examination showed it to depend on corpuscles like those just described, containing more or less black pigment, as exhibited in Figs. 23, 24.

Other constituents of catarrhal mucus observed in ordinary cases, that is to say in common colds, etc., are as follows: Nucleated corpuscles, as large and rather larger than the associated mucus corpuscles. They are round, oval, or irregularly polygonal, and pale granular. The nucleus is large, oval and provided with a nucleolus.

Epithelial cells of every variety, from the small pale granular nucleated form resembling the nucleated corpuscles just indicated, to the large squamous form such as line the cavity of the mouth.

Isolated granules, variable in quantity and size, some of them pale and obscurely defined, others globular and resembling molecules of oil.

Occasionally a few coloured blood-corpuscles, without the obvious presence of blood. In the crystal clear liquid which drops from the nose in the commencement of a coryza, I have at times observed two solid elements, consisting of blood-corpuscles. These were very few in number, the greater proportion being colourless corpuscles exhibiting their characteristic amœboid movements. The coloured corpuscles were so few that there were usually only from one to three at a time in the field of the microscope.



Explanation of the Figures.—Cell elements of catarrhal expectoration. All the figures magnified about 650 diameters.

Figs. 1–17. Mostly deformed epithelial cells.

Fig. 1. Globular cell, .009 mm., with minute vacuoles.

Fig. 2. Globular cell, .01 mm., containing a globular nucleus.

Figs. 3, 4. Reniform cells, .015 mm. long, without visible nucleus.

Figs. 5-7. Larger round, oval, and ovoid cells, .015 to .021 mm. long, with vacuoles; two with globular nuclei, and one without nucleus.

Fig. 8. Biscuit-shaped cell, .033 mm. long, with nucleus and small vacuoles.

Fig. 9. Gregarina-like cell, .024 mm., with nucleus. The circle of cilia waved up and down, while the head-like portion was bent from side to side.

Fig. 10. Gregarina-like cell, .027 mm. long by .021 mm. wide, with two nuclei. The head appeared covered with waving cilia, and the body rocked from side to side with a slight twist.

Figs. 11, 12. Columnar cells, .027 mm. long, with minute vacuoles, and one with nucleus.

Fig. 13. Columnar cell, .03 mm., with long protoplasmic vacuolated process projecting from amidst the crown of cilia.

Figs. 14, 15. Columnar cells, of nearly normal aspect, .036 to .039 mm.

Figs. 16, 17. Columnar cells, apparently deprived of their cilia, .027 mm.; one with two nuclei, the other with a single large nucleus.

In Figs. 2, 5, 6, 8, 9, 10, 12, the nucleus resembles a mucus corpuscle; in Figs. 14–17 it has the normal appearance. The specimens of 14–17 were dead or motionless; all the others exhibited waving of the cilia with active rocking motion of the body.

Figs. 18, 19. Ordinary mucus corpuscles, .009 mm., one with pseudopodal extensions.

Fig. 19. A pair of mucus corpuscles in contact.

Fig. 20. A chain of similar corpuscles, of which several contain vacuoles.

Fig. 21. Two large mucus corpuscles, containing oil globules, etc. Diameter .018 mm.

Fig. 22. A mucus corpuscle, with large oil globules. Diameter .024 by .018 mm.

Fig. 23. Globular mucus corpuscle, containing pigmentary matter, .018 mm. diameter.

Fig. 24. An oval corpuscle of the same kind, .024 by .015 mm. diameter.

ARTICLE VIII.

NOTE ON THE ELIMINATION OF ANTIMONY FROM THE HUMAN SYSTEM.

By HENRY MORTON, Ph.D., President of the Stevens Institute of Technology, Hoboken, N. J.

IN hopes of throwing some light on certain points connected with the elimination of antimony from the human system, concerning which there seems to be a degree of discrepancy, or at least uncertainty, in the works of the standard authorities on Toxicology, the following experiments were made by the present writer. Though they are far from exhausting the line of investigation indicated, it is believed that they at least establish some valuable data, and build up some few paces of the desired road.

In order to secure material for analysis, tartar emetic, in doses of half a grain each, was administered every evening, about ten o'clock, for three successive days, and the urine discharged was collected in two portions for each twenty-four hours, one being that discharged at rising in the morning, and the other consisting of the rest discharged at various times during the day and evening.

The analyses were conducted as follows: The fluid was concentrated to about one-third its volume by evaporation on the water-bath, hydrochloric acid was added, and sulphuretted hydrogen was passed through with occasional warming for about twelve hours. The precipitate was then separated by filtration and washed thoroughly, until no trace of chlorine could be detected in the filtrate with nitrate of silver. The filter